

Acute Stroke: What's new and what you really need to know

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11/12/15



Disclosures

- None



Objectives

- Review pathophysiology of acute stroke.
- Discuss the diagnostics strategies for acute stroke.
- Discuss the newest treatment modalities for acute stroke.



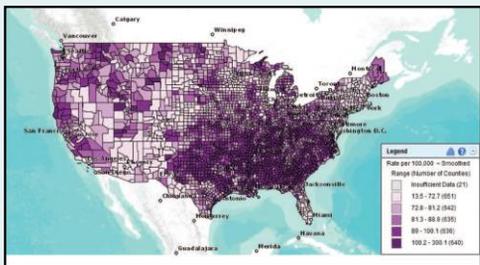
Why is it important?

- 4th leading cause of death (2011)
 - 5% of all deaths
- Leading cause of disability
 - 26% needs assistance
 - 26% needs long term placement
 - 33% have depression
- Direct/Indirect cost: \$33.6billion/year (2011)

Circulation. 2015;131:e29-e322
J Stroke Cerebrovasc Dis. 2009;12:115-126.
Stroke. 2005;36:1330-1340.



Stroke Belt (2010)



Circulation. 2014;129(3):e28-e292



TIA (aka mini-stroke)

- Resolution of symptoms within 24 hours
 - No radiographic signs of stroke (Controversial)
- Incidence: 2.3% (~5M people)
- 15% strokes preceded by TIA
 - 1/3 of TIAs are actual strokes (by MRI)
- After TIA, up to 17% will have a stroke
 - Up to 5% will have within 2 days
- Up to 12% will die within 1 year



“Wake Up” Strokes

- Patient’s awoken from sleep with symptoms
- Unknown time of onset
- Stroke wakes up patient?

Kinds of Stroke

Ischemic: 87%

Mortality:

- 1 month: 10%

Types:

- Thrombotic
- Embolic
- Hypoperfusion

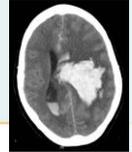
Hemorrhagic: 13%

Mortality:

- 1 month: 38%

Types:

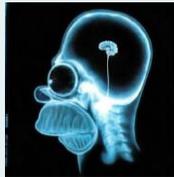
- Intracerebral (10%)
- SAH (3%)



Circulation. 2014; 129(3):e28-e292

Brain consumption

- 2% of body mass
- Metabolic Demand:
 - 15% of cardiac output
 - 20% of oxygen consumption
 - 25% of glucose consumption
- Failure to meet: loss of consciousness
 - Minutes to irreversible neuronal death



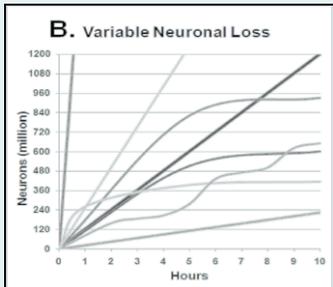
Stroke Treatment



Acute Treatment Time Frame

- Within 3 hours
- 3 – 4.5 hours
- Within 8 hours (and beyond!)

Brain Drain – 2M Neurons/min



Identification

How Good Are We At Diagnosis?

- Physician
 - Misdiagnosis: up to 20%
 - Misdiagnosed as stroke: up to 20% (outpatient)
- EMS
 - (1995) 28% misdiagnosed as stroke
 - (2008) 83% Sensitivity; 42% PPV

Neurology, 55 (2000), pp. 1801–1805



Missed diagnosis of stroke in the emergency department: a cross-sectional analysis of a large population-based sample

David E. Newman-Toker¹ / Ernest Moy² / Ernest Valente³ / Rosanna Coffey⁴ / Anika L. Hines⁴

¹ Department of Neurology, The Johns Hopkins University School of Medicine, Baltimore, MD, USA

- 12.7% of admitted stroke patients had ED visit within previous 30 days
- Headache and Dizziness most likely missed
- Young, female, non-White

Newman-Toker DE, et al. Diagnosis. 2014; 1(2): 155–166.



Stroke



Distinguishing Between Stroke and Mimic at the Bedside: The Brain Attack Study
Peter J. Hand, Joseph Kwan, Richard L. Lindley, Martin S. Dennis and Joanna M. Wardlaw

31% Admitted – stroke mimickers

Mimics: Seizures, encephalopathy, sepsis

Stroke 2006; 37:769-775



EMS Screening Tools

- Prehospital Stroke Screen (7 methods):
 - CPSS
 - LAPSS
 - MASS
 - Med PACS
 - OPSS
 - ROSIER
 - FAST



Cincinnati Stroke Scale

3 components:

- **F**acial Droop
- **A**rm Drift
- **S**lurred Speech
- **T**ime (onset)



© American Heart Association



LA Stroke Screen

- Age ≥ 45
- No prior history of seizure
- New onset of neuro symptoms < 24 hrs
- Ambulatory at baseline
- Glucose between 60 and 400
- Asymmetry of face, grip, arm weakness
- Unilateral weakness (not bilateral)

Stroke. 2000 Jan;31(1):71-6.



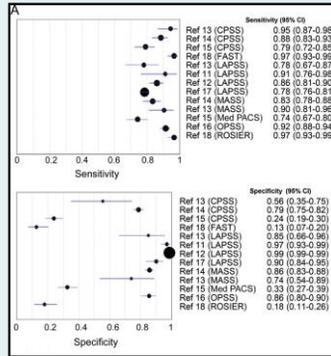
How Good are CPSS/LAPSS?

- Early studies showed high sensitivity and specificity
- Recent studies (Sensitivity/Specificity):
 - CPSS: 80%/48% LAPSS: 74%/48%
 - CPSS: 79%/24% Med PACS: 74%/33%

Ann Emerg Med. 2014;64(5):509-15
Prehosp Emerg Care. 2013;17(3):348-53.

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Neurology. 2014 Jun 17;82(24):2241-9.

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Takeaway - Identification

- Any are probably okay (Better than nothing)
- LAPSS is probably better than CPSS
- All require training (and re-training)

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Prehospital Interventions

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Classic Teaching

- IV, O₂, Monitor (ACLS)
- Hypoxia is BAD
- But is more O₂ the better?

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Physiological Effects of O₂

- Vasoconstriction to carotid
- 20-33% decrease cerebral blood flow
 - (100% O₂ for 10-15 min)

Critical Care 2013, 17:313

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Evidence for (Against) O₂

- HBOT – no benefit in acute ischemic stroke
- No improvement in functional outcomes
- Mortality OR 0.45 (Against O₂)
- AHA/ASA guidelines rec AGAINST routine O₂

Cochrane Database Syst Rev. 2005;(3):CD004954.
Ann Indian Acad Neurol. 2010; 13:284-288.
Stroke. 2013;44(3):870-947

Takeaway

- Do NOT routinely use supplemental O₂ unless hypoxic

Medications

- Neuroprotective strategies
- BP management?
- Aspirin?



- Phase III trial
- Neuroprotective
- No Benefit (but no harms)
- Creates system for future trials for prehospital acute stroke

http://www.medscape.com/viewarticle/820638#vp_3

BP Management

- What to do with HYPOTensive patients?
- What to do with HYPERtensive patients?

Aspirin

- No clear benefit of emergent Aspirin
- Unable to differentiate Ischemic vs Hemorrhagic

Takeaway

- No medications proven benefit at this time
- Only treat BP if HYPotensive (may consider treatment if SBP > 220 or DBP 120)

Transporting

Should Patients be sent to PSC?

- Initial evidence for recommendation was weak (ie non-existent)
- Several studies have come out since then
- Political issue?

Stroke Certification

TJC/DNV

– Strict requirements



Required Elements
Education
System Process
QA
Discharge/Rehab
IV tPA



What Does the Evidence Show?

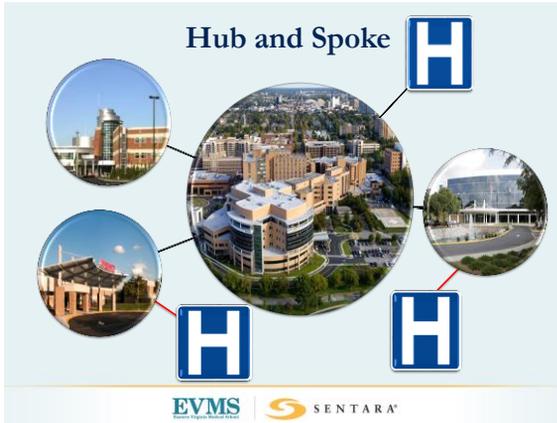
- Evidence suggests:
 - Lower 30-day mortality (10.1% v. 12.5%)
 - Increase IV tPA (4.8% v. 1.7%)
- However
 - Same effect if not certified?

Neurology. 2005;64(3):422-7
JAMA. 2011;305(4):373-80

CSC vs PSC vs NSC

- Use of IV tPA much higher in CSC
 - CSC v. PSC: OR 2.35
 - PSC v. NSC: OR 2.48
- Mortality lower (OR 0.95)
- CSC offers consistent Interventional treatments

Neurology. 2010 75(18):1589-96.



Takeaway

- Probably is important
- Helps identify who can perform at a higher level
 - (Many states require it)
- Evidence not there for EMS to go to CSC vs PSC

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Method of Transport

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Air vs. Ground

- Drip and Ship
- Shorter transport times
 - 53 min vs 68 min
- No outcome benefit
 - Unless for Interventional therapy

Stroke. 2012;43(3):878-80

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Who to Fly? (Scene)

- Likely benefit if > 1 hour ground transport time
- Logistics

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Evaluation in the ED

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Emergency Department

- Protocols
- Precision/Execution
 - D2N ≤ 60 min

ED SUSPECTED STROKE/TIA ORDERSET [594]

3/1/14 added 5:01:16
 12/15/09 IV Therapy changes
 11/30/09 added order for Post Warlock
 8/18/09 added POC labs
 2/3/09 all sections opened. Added ASA links. prechecked mult orders in mult sections

ED orders for symptoms of stroke or TIA.
 ASA ICH Guidelines Stroke 2007
 URL: Q:\Micromedex\PDF\ASA ICH Guidelines Stroke 2007.pdf
 ASA Ischemic Stroke Guidelines Stroke 2007
 URL: Q:\Micromedex\PDF\ASA Ischemic Stroke Guidelines Stroke 2007.pdf
 ASA SAH Guidelines 2009
 URL: Q:\Micromedex\PDF\ASA SAH Guidelines 2009.pdf



ED – Stroke Alert Process

Time	Target
Door to MD	10
Door to CT	25
Door to CT read	45
Door to Needle	60
Door to Admit	180



Telemedicine

Long-term outcome after thrombolysis in telemedical stroke care

S. Schwab, B. Vazankhah, MD, C. Kukla, MD, M. Hauschwitz, MD, U. Bogdahn, MD, A. Först, MD, H. J. Audebert, MD, M. Horn, MD and On behalf of the TEMPS Group

Telestroke-Guided Intravenous Tissue-Type Plasminogen Activator Treatment Achieves a Similar Clinical Outcome as Thrombolysis at a Comprehensive Stroke Center

Syed F. Zaidi, MD, Mouhammad A. Jumma, MD, Kabier N. Urra, MD, Mazim Hammer, MD, Lori Massaro, CRNP, Vivek Riddby, MD, Tudor Jovin, MD, Ridwan Lin, MD, PhD, Lawrence R. Wechsler, MD

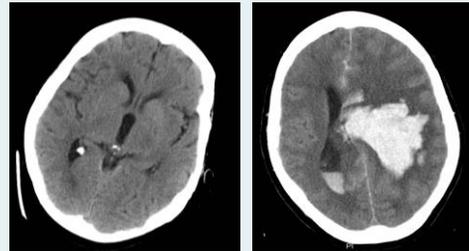
Remote Supervision of IV-tPA for Acute Ischemic Stroke by Telemedicine or Telephone Before Transfer to a Regional Stroke Center is Feasible and Safe

Muhammad A. Pervez, MD, Gisele Silva, MD, PhD, Shihab Masrar, MD, Rebecca A. Betensky, PhD, Karen L. Farris, MD, MPH, Kenzo Hidalgo, MD, Fabricio Lima, MD, Eric S. Rosenthal, MD, Natalia Rost, MD, Anand Viswanathan, MD, Lee H. Schwamm, MD

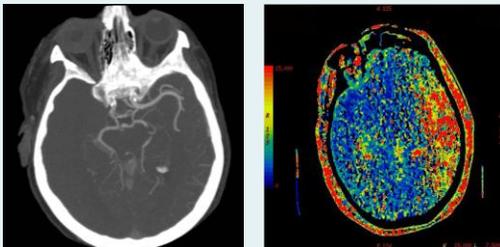
Schwab Neurology 2007; Zaidi Stroke 2010; Pervez Stroke 2011



Head CT Scan

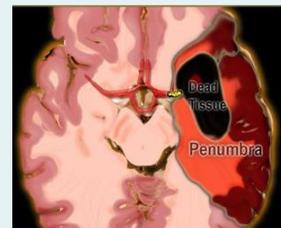


CTA and CTP

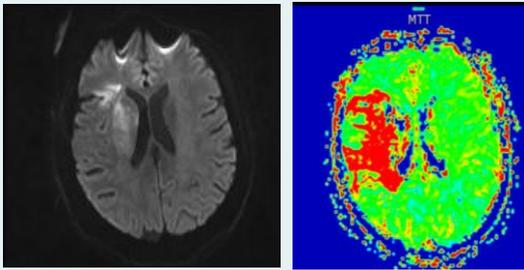


Penumbra

Area of injured tissue (viable)
 - Collateral



MRI – DWI/PWI



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MRA



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How good is MRI?

Magnetic resonance imaging and computed tomography in emergency assessment of patients with suspected acute stroke: a prospective comparison

Julia A. Chalec, Chelsea S. Edwards, Lauren M. Nemnich, Marie-Luise John, Alan Bitman, Andrew M. Demchuk, Michael D Hill, Nicholas Patronos, Lawrence Lipton, Steven Warach

- Sensitivity for Acute Stroke:
 - MRI: 83% (77-88%)
 - CT: 26% (20-32%)
- Detected Acute Stroke:
 - MRI: 46% (35-56%)
 - CT: 7% (3-14%)

Lancet 2007; 369: 293–98

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Prehospital Notification

- Improved metrics
- Decreased D2N times with prehospital notification
- Higher tPA usage

JAMA. 2014;311(16):1632-1640
Circ Cardiovasc Qual Outcomes. 2012 Jul 1;5(4):514-22
Stroke. 2011;42:2263-2268

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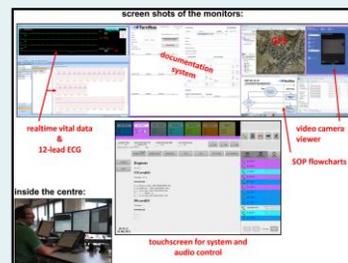
Prehospital Stroke Alert

- GWTG recommends:
- Prehospital Notification
- Prehospital Stroke Alert
 - Activate stroke team (if available)
 - Highly trained EMS accurate 66% for stroke
 - Evidence marginal benefit in improvement of metrics

http://www.strokeassociation.org/STC/groups/heart-public/@wcm/@private/@ncm/@pvtg/documents/downloadable/ucm_310253.pdf
Neurosurgery. 2014 Mar;74(3):281-5;

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Prehospital Telemedicine



Scand J Trauma Resusc Emerg Med. 2013;21:54

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Prehospital Telemedicine



Scand J Trauma Resusc Emerg Med. 2013;21:54



MEETING COVERAGE 03/12/2015

Mobile Stroke Unit Cuts Time to tPA Treatment

— Cleveland program reports 40-minute reduction while Houston program treats patients within an hour.

- Prehospital stroke units
- 10% treatment rate

<http://www.medpagetoday.com/MeetingCoverage/ISNeuroEdison/49985>



Phantom-S Trial

“Stroke Ambulance”

Onboard:

- CT/Telerad
- Labs



EMS call to needle time

- Decrease from 77 to 52 min
- IV tPA increased from 21% to 33%

JAMA. 2014;311(16):1622-31



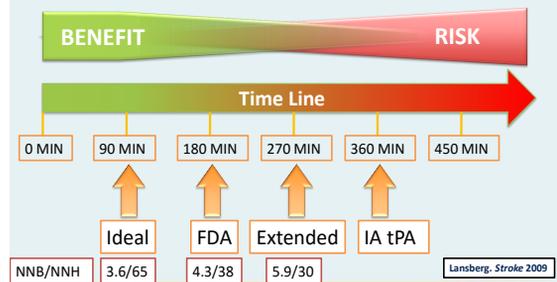
Prehospital Telemedicine

- Better identifying stroke?
- Unknown whether it improves outcomes
- Can be expensive
- More to come....



Treatment

Treatment with IV tPA



Original Contribution | June 19, 2013

Time to Treatment With Intravenous Tissue Plasminogen Activator and Outcome From Acute Ischemic Stroke

Jeffrey L. Saver, MD; Gregg C. Fonarow, MD; Eric E. Smith, MD, MPH; Matthew J. Reeves, PhD; Maria V. Grau-Sepulveda, MD, MPH; Wenqin Pan, PhD; DaiWai M. Olson, PhD; Adrian F. Hernandez, MD, MHS; Eric D. Peterson, MD, MPH; Lee H. Schwamm, MD

JAMA. 2013;309(23):2480-2488. doi:10.1001/jama.2013.6959

Text Size: A A

- For every 15 minutes:
 - Less in-hospital mortality: OR 0.96
 - Less ICH: OR 0.96
 - More independent ambulation at d/c: OR 1.04
 - More D/C home: OR 1.03



Complications of IV tPA

- Cerebral hemorrhage
 - 6.4% (NINDS)
 - Half were clinically significant
 - Related to following protocol
 - Other registries: < 2% sICH
- Angioedema
 - 1-5%



Safety and Outcomes of Intravenous Thrombolysis in Stroke Mimics A 6-Year, Single-Care Center Study and a Pooled Analysis of Reported Series

Georgios Tsivgoulis, MD; Andrei V. Alexandrov, MD; Jason Chang, MD; Vijay K. Sharma, MD; Steven L. Hoover, MD; Annabelle Y. Lao, MD; Wei Liu, MD; Eleftherios Stamboulis, MD; Anne W. Alexandrov, PhD; Marc D. Malkoff, MD; James L. Frey, MD

Table 3. Prevalence and Outcomes of SM Among Patients Treated With IVT Across Different Stroke Registries

Registry	IVT (No.)	SM (No., %)	sICH in SM (No., %)	OE in SM (No., %)	FI in SM (No., %)
Michigan ^a	151	6 (4%)	0	NA	1 (17%)†
Basel ^a	250	7 (3%)	0	0	6 (86%)‡
Houston ^a	512	69 (13%)	0	0	60 (87%)†
Pittsburgh ^a	254	9 (4%)	NA	NA	NA
Phoenix	539	56 (10%)	0	0	54 (96%)†
Overall	1706	147 (9%)	0 (0%)	0 (0%)	121 (83%)
		(95% CI, 7% to 10%)	(95% CI, 0% to 2.3%)	(95% CI, 0% to 2.4%)	(95% CI, 81% to 93%)

SM indicates stroke mimic; IVT, intravenous thrombolysis; sICH, symptomatic intracranial hemorrhage; OE, orolingual edema; FI, functional independence defined as a modified Rankin Scale score of 0 to 1; NA, not available.
†Calculated by the Adjusted Wald method.
‡At hospital discharge.

Tsivgoulis et al. Stroke 2011



Target Stroke

- 10 care strategies
- Increased tPA < 60 min:
 - 29.6% vs 53.3% (P < 0.001)
- Decreased mortality
 - 9.93% vs 8.25% (OR – 0.89)

JAMA. 2014;311(16):1632-1640.



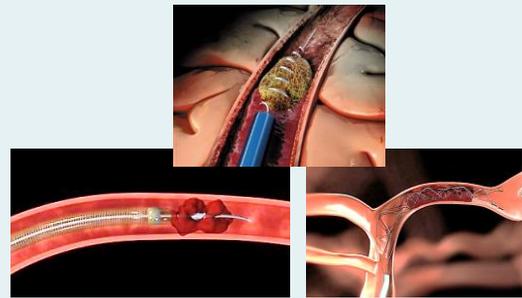
Target Stroke Goals (Phase II)

- IV tPA < 60 min: at least 75%
- IV tPA < 45 min: at least 50%

http://www.strokeassociation.org/STROKEORG/Professionals/TargetStroke/TargetStroke-The-Challenge-and-How-We-Answer-it_UCM_432409_Article.jsp



Interventional Therapy



The NEW ENGLAND
JOURNAL of MEDICINE

ESTABLISHED IN 1812 MARCH 7, 2013 VOL. 366 NO. 10

Endovascular Therapy after Intravenous t-PA versus t-PA Alone for Stroke

A Trial of Imaging Selection and Endovascular Treatment for Ischemic Stroke

Endovascular Treatment for Acute Ischemic Stroke

Alfonso Ciccone, M.D., Luca Valvassori, M.D., Michele Nichelatti, Ph.D., Annalisa Sgoifo, Psy.D., Michela Ponzio, Ph.D., Roberto Sterzi, M.D., and Edoardo Boccardi, M.D., for the SYNTHESIS Expansion Investigators*

NEJM, 2013, Vol. 368

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The NEW ENGLAND
JOURNAL of MEDICINE

HOME ARTICLES & MULTIMEDIA ISSUES SPECIALTIES & TOPICS FOR AUTHORS CME

ORIGINAL ARTICLE A Correction Has Been Published

A Randomized Trial of Intraarterial Treatment for Acute Ischemic Stroke

Olvert A. Berkhemer, M.D., Pluck S.S. Franssen, M.D., Debbie Beumer, M.D., Lucie A. van den Berg, M.D., Heister F.

- MR CLEAN trial (N = 500)
- 13.5% absolute increase in favorable outcome (mRS 0-2)
- No increase in hemorrhage

N Engl J Med 2015; 372:11-20

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ORIGINAL ARTICLE

Randomized Assessment of Rapid Endovascular Treatment of Ischemic Stroke

Mayank Goyal, M.D., Andrew B.

HOME ARTICLES & MULTIMEDIA ISSUES SPECIALTIES & TOPICS FOR AUTHORS CME

ORIGINAL ARTICLE

Endovascular Therapy for Ischemic Stroke with Perfusion-Imaging Selection

M. Dewey, M.D., Leonard Chaturvedi,

HOME ARTICLES & MULTIMEDIA ISSUES SPECIALTIES & TOPICS FOR AUTHORS CME

ORIGINAL ARTICLE

Stent-Retriever Thrombectomy after Intravenous t-PA vs. t-PA Alone in Stroke

Jeffrey L. Saver, M.D., Mayank G.

HOME ARTICLES & MULTIMEDIA ISSUES SPECIALTIES & TOPICS FOR AUTHORS CME

ORIGINAL ARTICLE

Thrombectomy within 8 Hours after Symptom Onset in Ischemic Stroke

Tulsi G. Jovin, M.D., Angel Chamorro, M.D., Eder Cobos, Ph.D., Maria A. de Miquel, M.D., Carlos A. Molina, M.D., Joo

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2015 American Heart Association/American Stroke Association Focused Update of the 2013 Guidelines for the Early Management of Patients With Acute Ischemic Stroke Regarding Endovascular Treatment

A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists.

Transport to nearest stroke center (Class I; LoE A)

Patients should receive INR if NIHSS ≥ 6 (Class I; LoE A)

Stroke. 2015;46(10):3020-35

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Conclusion

- Evaluation
 - Should use a screening tool, but all have limitations
- Prehospital Treatment
 - Less is more
 - Only treat if hypoxic or hypotensive
- Destination
 - PSC/CSC

brucel01@yahoo.com

